Environment Canada

Environnement Canada

Program Evaluation Branch

Direction de l'évaluation des programmes

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HUMAN HEALTH COSTS

OF ENVIRONMENTAL POLLUTION

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ANNOTATED BIBLIOGRAPHY

Program Evaluation Branch
Environment Canada

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PREFACE

"Human Health Costs of Environmental Pollution--Annotated Bibliography" had its origins in an agreement between the Program Evaluation organizations of Health and Welfare Canada and Environment Canada to collaborate in areas of common interest, such as in the evaluation of HWC's Environmental Hazards Program.

As an initial contribution, Environment Canada's Program Evaluation Branch undertook a survey of relevant literature on the environment side.

One of the classic purposes of evaluation is to provide data to support resource allocation decisions by senior management. But in the absence of a solid understanding of the costs of pollution, it is difficult to determine exactly how much we should spend on protecting society against the effects of pollution.

Linkages between pollution and disease are often not clear, although the cost of disease, disability and death, is all too obvious.

Deficit reduction is a universal concern, so there are strong pressures not to overspend. On the other hand, with an aging population such as ours, the cost of the health care facilities and services that will be required in the next twenty years if we miscalculate and underspend on protection, might be might be more than we could accept.

This bibliography will not answer the question: How much should we spend on environmental protection to avoid unacceptable health care costs? However, its authors hope that it will contribute to informed discussion.

INTRODUCTION

This document is presented as a users' guide to sources of information on the relationship between human health and environmental pollution. The health-environment linkage is revealed through health impacts (illness, diseases, deaths, costs) that are associated with air, water and soil pollution caused by toxic chemicals, aerosol sprays, acid rain, nuclear fall-out, oil spills, industrial activities such as pulp and paper manufacturing, industrial accidents, etc.

Gathered from books, magazines, professional journals, articles, and newspapers, the material is arranged by authors listed alphabetically. In most cases, each entry contains the following: the author's name (or authors' names); its title; the publisher; year of publication; and the number of pages in the original. These are followed by a brief abstract of the contents to emphasize such aspects as rationale, purpose, assumptions, research methodology, weaknesses and or strengths, findings and or recommendations.

Adler, J., "Our Befouled Beaches," Newsweek, July 27, 1987. Pages 50-52.

This Newsweek article marked the end of the mass media's relative apathy towards the rapidly deteriorating state of the world's oceans in general and North American beaches in particular.

While this is its major significance, the article represents a reasonable journalistic survey of the nature and extent of the problems that were most visible in the Summer of 1987.

Alberta Environment Conservation Authority, Environmental Effects of the Operation of Sulphur Extraction Gas Plants in Alberta: Report and Recommendations, The Authority, Edmonton, 1973. 128 pages.

The report stems from a series of public enquiries aimed at directing attention to the environmental effects of the operation of sulphur extraction plants, in response to public concerns about the environmental and health effects of sour gas operation on lives, livelihoods, and hence immediate communities.

The report informs that land surface of Alberta is varied, richly fertile and extensively used for agriculture, forestry, and recreation. On the other hand, below the surface, seams of coal are present, as well as oil, gas, tar sands and other minerals. The report notes the problems that can arise when the various surface and subsurface resources are used in ways which are not compatible, and suggests that an important consideration is the extent to which resource uses and the possible conflicts will affect the livelihood and well-being of citizens.

Submissions and responses to questions, as presented at the hearings, are published in a detailed transcript entitled "Proceedings of the public Hearings on the Environmental Effects of the Operation of Sulphur Extraction Gas Plants".

Bates, D.V., "Relationship Between Air Pollutant Levels and Hospital Admissions in Southern Ontario," Canadian Journal of Public Health, Ottawa, Ontario, March/April, 1983. Pages 117-122.

Ontario Hospital Insurance Plan (OHIP) data for the years 1974,1976, 1977, and 1978 (no data for 1975) obtained from 79 acute care institutions between Windsor and Peterborough for the months of January and February as well as July and August of each of the years are reviewed, in order to note differences in hospital admissions between the winter and summer months.

For the total population, hospital admissions averaged approximately 2400 per day of which about 90 were related to air pollution.

Berlin, A., Wolff,A.D., and Hasegawa, Y., The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants, Martinis Nijohn Publishers, 1979. 368 pages.

This document reports on an International Workshop" The Use of Biological Specimens for the Assessment of Human Exposure to Environmental Pollutants" that was sponsored by the Commission of European Communities, the United States Environmental Protection Agency, and the World Health Organisation. The workshop was held in Luxemburg City, Luxemburg, during the period, April 18-22,1977.

Conceptual and operational aspects of the systematic sample collection, preparation, analysis and storage of biological specimens are presented with a view to obtaining an insight to the potential risks of pollution to humans.

Bird, P.M., and Rapport, D.J., State of the Environment Report for Canada, Ministry of the Environment, Ottawa, 1986. 263 pages.

This is the first comprehensive report undertaken on the State of the Environment for Canada. It pieces together a wide selection of available information in such a way that patterns of environmental changes can be identified and understood. It also describes the conditions of our farmlands, forests, waters, wildlife and other natural resources.

The document suggests that the environment is the foundation on which all economic and social activities are based. The authors express the view that systematic, comprehensive,regular reporting on the state of the environment is no less indispensable to the country than statements of national accounts or of cost of living indexes. In that regard, the reporting is as essential to individual Canadians as a bank statement or a regular medical examination.

Bissett, D.W., (et al), Bhopal Aftermath Review: An Assessment of the Canadian Situation, Environment Canada, 1986. 238 pages.

On December 3, 1984, the world's most tragic chemical accident occurred in Bhopal, India. Over 2000 people were killed and thousands injured. Shortly after the Bhopal release, Canada's Minister of the Environment announced that departmental officials would be contacting their federal and provincial colleagues and representatives of industry to assess the adequacy of existing (Canadian) accident prevention and emergency preparedness measures.

One of the lessons learned from Bhopal is that large-scale human suffering and death can result from chemical accidents. Another is that a population that benefits from technological advances faces the risk of adverse effects, and that risk cannot be eliminated. The authors suggest that such accidents, as well as smaller incidences and near misses, must be studied in depth for the many lessons they can provide to prevent and mitigate the effects of future disasters. Identifying the lessons in hindsight and documenting them is an easier, but less important task. People within an organization must be committed to frequent reviews and applications of such lessons for their own situations. As a loss prevention expert once said "Organizations have no memories. Foresight and preventative action before that next event occurs is the more difficult and important task."

Brown, L.R., (et al), State of the World 1988: A Worldwatch Institute Report on Progress Towards a Sustainable Society, W.W. Norton & Company, 1988. 237 pages.

Changes in atmospheric chemistry, air pollution, acid rain, ozone depletion, and the build-up of greenhouse gases, have attracted the attention of scientists and aroused concern among the general public. When the subject volume was launched, ozone depletion due to the discharge of chlorofluorocarbons into the atmosphere seemed to have stirred little more than academic interest. Currently, it is of national concern for governments everywhere.

Evidence accumulating over the last five years indicates that the earth's average temperature has begun an upward climb. Within governments, a vague awareness of the environmental consequences of climate changes is giving way to deepening concern. This is perhaps more pronounced in low lying countries, where rising sea levels could be at best extremely costly, or, at worst, catastrophic.

The last few years have seen an extraordinary burst of international concern over the future of the earth's tropical rain forests. People are starting to realise that if this irreplaceable resource is depleted, much of the earth's diverse plant and animal life would disappear. They have come to share a sense of foreboding, a sense that the human prospect may be tied more closely to the future of these forests than is generally realised.

The authors express the view that decisions of this generation will determine whether the earth remains habitable, and that unless ripples of public awareness build to a groundswell of support for far-reaching changes, observed trends may be irreversible.

Brune, D., Nordburg,G., and Wester, P.O., Distributions of 23 Elements in the Kidney, Liver and Lungs of Workers From a Smelter and Refinery in North Sweden Exposed to a Number of Elements and of a Control Group, Elsevier Scientific Publishing Company, Amsterdam, 1980.

The levels of antimony, arsenic, cadmium, chromium, cobalt, copper, gold, iron, lanthanum, lead, manganese, mercury, molybdenum, phosphorous, rubidium, scandium, selenium, silver, tellurium, tin, tungsten, and zinc, in the kidney, liver and lungs of autopsy specimens from exposed workers in North Sweden, as well as from a control group, were assayed quantitatively. The workers were exposed to several of these elements and their compounds for long periods in arsenic, lead and selenium plants or copper smelters.

The analysis was carried out by neutron activation and atomic absorption spectrophotometry. Median levels of the aforementioned chemicals were found to be 2 to 16 times greater in the research group than the corresponding levels in the control group. Long biological half-life values were observed for these elements, especially in lung tissue.

Burton, M.A.S., Biological Monitoring of Environmental Contaminants (Plants), Marc Publications, 1986.

In this work based on plants, biological monitoring was used in its broadest sense. The aim was to examine the types of measurements which can be made on plants to detect changes under contaminated conditions.

The document indicates that biological monitoring can be defined as measurement of the responses of living organisms to changes in their environments, and that the term has various connotations. For example, "Biological monitoring is simply used to refer to the chemical analysis of contaminants in human tissues, particularly in occupationally exposed populations or individuals. It is also used for assessments of river water quality based on measurements of populations or communities of invertebrate fauna. In a much broader sense, it is used for the measurement of effects in growth and metabolism and of concentrations of contaminants in a wide range of living organisms.

In a strict sense, the term monitoring may be reserved for measurements made on a regular basis to ensure compliance with standards of environmental quality.

Ceraso, J., (et al), New York City's Water Supply: Acid Deposition, Inorganic Pollution and the Catskill Reservoirs, Environmental Defence Fund, New York, October, 1986. 138 pages.

This report presents an analysis of acid deposition and other pollution in the Catskill reservoir system of New York City's drinking water supply. Water quality data from the New York City Department of Environmental Protection (DIP) were used.

The study measured the extent to which the Catskill reservoir is being affected by acid rain, with a view to assessing the amount of reservoir and watershed pollution. The most important conclusion arrived at is that although water supply quality remains high, it has been deteriorating.

Cleary, J.J., and Stebbing A.R.D., "Organotin in the Surface Microlayer and Subsurface of Southwest England", Pergamon Journals Ltd., 1987. Pages 238-245.

The paper describes the vertical distribution of organotins in harbours and estuaries of Southwest England, as determined in samples taken during 1986 from sites previously surveyed in 1984. In the more recent survey, profiles were sampled and it was found that the highest organotin concentrations occurred in the surface microlayer, that there was no systematic decline in concentration since 1984, and that concentrations in areas of commercial shipping activity were low compared to areas where small boats were abundant. Organotin levels throughout the water column were sufficiently high to cause chronic toxic effects in sensitive organisms at the majority of sites surveyed.

Coffin, D.L., "Symposium on Health Effects Investigation of Oil Shale Development", Gatlinburg, Tenn., 1980. Pages 1-6.

The production of petroleum substitutes from coal and oil shale is a crucial component of national efforts to achieve energy sufficiency. It is generally agreed that the associated environmental and health issues should be addressed in concert with engineering issues. Unexpected and undesirable ecological and biological impacts might thus be identified early enough in the developmental phase and be avoided or eliminated when commercialization occurs. Furthermore, synfuels processing is certain to involve materials of unique chemical and physical properties as compared to petroleum processing. It is therefore expected that products and by-products will be the subject of intense chemical and biological testing requirements by federal regulatory agencies. Early studies reveal that using synfuels-related samples are essential in developing and validating reliable chemical and biological testing methods.

The purpose of such an health effects program is to develop suitable methods and provide timely information on the biological properties of important synfuel technology components.

Committee on the Assessment Health Effects of Great Lakes Water Quality, Annual Report to the International Joint Commission (IJC), 1983. 30 pages and appendix.

The Committee reports to the IJC highlights of its activities during the previous year. It addresses questions of public perception of environmental health issues in an effort to provide some explanation of the relative roles of toxicology and epidemiology in identifying environmental hazards - a prerequisite to the setting of objectives, guidelines and standards. Based on its assessment/analysis, the Committee expresses "considerable uncertainty" about decisions relating to human health protection standards that are based on extrapolation of toxicology data or on epidemiological studies in cases where low-level exposure is at issue. This view is based on the observation that each of the two approaches has its specific methodological limitations.

With regard to protecting drinking water sources, the Committee thinks that by merely protecting the lakes and their tributaries, waste dumping would be encouraged further inland, - a practice that would still affect drinking water quality adversely, and would therefore "warrant the attention of the IJC under the ecosystem concept embraced in the 1978 Water Quality agreement".

A major activity of the year involved the evaluation of chemicals found in the lakes. This included the assessment of monitoring and surveillance data in terms of chemicals abundance and distribution, as well as of levels of human exposure to them. In addition, the Committee attempted to determine whether agencies had developed Acceptable Daily Intake (ADI) values and, in the absence of such values, whether available toxicity data were sufficient to provide reliable bases on which to decide on the amounts of chemicals that are likely to be hazardous to human health.

The need for additional data, knowledge and research is stressed, repeatedly, and the Committee is optimistic that with proper funding and continued efforts by the agencies involved, it (the Committee) will be able to state with greater confidence (than was then possible) "that the... Basin is a healthy place in which to live".

Committee on the Assessment of Human Health Effects of Great Lakes Water Quality, Annual Report to the International Joint Commission, 1985. 74 pages and appendices.

This report presents highlights of the Committee's activities during the period since 1983 when it reported last. The following activities are reported:

- evaluation of lake chemicals for which monitoring and surveillance had been recommended earlier;
- preparation of toxicity profiles of chemicals included in the 1983 inventory;
- assessment of lead contamination of fish;
- epidemiological evaluation of human health effects of the Great Lakes chemicals;
- health related surveillance and monitoring programs of the water and effluents;
- review of the Great Lakes international surveillance plan; and
- analysis of the relationship between fish tumors and human cancer.

In each case, findings, conclusions and or recommendations are put forward.

Committee on the Assessment of Human Health Effects of Great Lakes Water Quality, Workshop on "The Role of epidemiology in Assessing the Effects of Great Lakes Water Quality on Human Health", the International Joint Commission, Working Document, 1988. 445 pages.

Prompted by the paucity of epidemiological activity in the area of water pollution and health, the existence of militating, "enormous and perhaps intractable" methodologic problems, a recognition of the need to improve the status quo, and an hypothesis that there may be feasible methodologic options, this workshop was convened by the IJC Planning Committee on March 2-3, 1988, at the Guild Inn, Scarborough, Ontario. The purpose of the workshop was to engage in high-level professional discussions/ exchanges in connection with the IJC's interest "in evaluating the usefulness of epidemiology as a tool in surveillance of health problems related to contamination of the waters of the Great Lakes".

The workshop was designed to address and make recommendations on the following areas of concern:

1. Modifications that could be made to available data bases, or the types of new data bases that are required, so as to render the data more valuable for epidemiological research;

2. Types of epidemiological studies that could be undertaken, mindful of the various water quality parameters and adverse health outcomes, the adequacy and quality of available data, as well as of resources and time constraints;

3. Criteria that should be used in assessing the feasibility of proposed epidemiological studies.

4. The role of epidemiological evidence in dealing with concerns of a community that its water supply may be injurious to the health of its citizens; and

5. The available sources and adequacy of funding to defray the cost of epidemiological studies.

At the workshop, empiric and speculative papers were presented; the former group dealt with Canada-U.S. data sources while the latter addressed methodological options and proposals for future study.

Congress of the U.S. Office of Technology Assessment, "Technologies and Management Strategies for Hazardous Waste Control", Washington D.C. Pages 198-212.

The belief that ocean dumping was threatening both the value of marine environment and human health led to national and international measures to limit, if not prevent, the continued use of the ocean for waste disposal.

Materials being dumped include the following:

1. Material resulting from dredging activities which facilitate effective operations of ports and harbours.

2. Sewage sludge produced by municipal secondary treatment plants.

3. Municipal wastes through pipelines to ocean outfalls.

4. Acids which are neutralized by seawater.

5. Marine incineration of toxic wastes such as organic chloride waste, Agent Orange and PCBs aboard specially designed vessels.

Dassen, W., "Decline in Children's Pulmonary Function During an Air Pollution Episode", Journal of the Air Pollution Control Association (JAPCA), November, 1986. Pages 1223-1227.

"From January 16 to 21,1985, an air pollution episode occurred throughout Western Europe." This report studies the effects of this episode on the pulmonary functions of one hundred and sixty-three primary school children.

The episode had 24-hour average sulphur dioxide (SO2) and total suspended particulate matter (TSP) concentrations of 200-250mg/m3 which was associated with a decrease in pulmonary functioning among the children. Measurement results are presented in written, tabular, and graphic forms.

De Bruin, A., Biochemical Toxicology of Environmental Agents, Elsevier/North-Holland Biomedical Press, 1976.

"The growing contamination of the environment with toxic agents is a matter of increasing awareness in modern times. Potential hazardous substances, regarded as foreign to the body and appropriately termed xenobiotics, confront mankind in nearly all spheres of human activity." Xenobiotics may be toxic, thereby meriting particular consideration, or may be constituted of compounds which present carcinogenic or mutational risk. Apart from these, exposure to a few physical agents, including ionising radiation, noise and vibration, is recognized to be detrimental to human health.

The author's aim is to provide a thorough and up-to-date account of the molecular and biological aspects of harmful agents, both chemical and physical. Considering the tremendous expansion of research performed during past decades, it seemed desirable to assemble the existing knowledge into an integrated package. This treatise is intended to serve, principally, as an informative reference for researchers in various areas of investigation.

Consisting of 42 chapters, each chapter starts with a brief introductory account of the biochemical essentials of the particular topic and concludes with statements on radiation. References are provided (in most chapters) to increase the usefulness of this substantial collection of pertinent literature.

Department Of National Health and Welfare, An Evaluation of the Environmental Hazards Programme, Health Protection Branch, Ottawa, Ontario, August,1984. 139 pages, plus Appendices.

Conduct of this evaluation study was approved in July 1983 by the Deputy Minister, department of National Health and Welfare, on the basis of recommendations contained in a programme evaluation assessment study of the environmental hazards programme.

The purpose of the study was to provide a report for the Deputy Minister in order to:

1. provide answers to eleven evaluation questions approved by the Deputy Minister and identified in the evaluation assessment study, and

2. make recommendations to the Deputy Minister to assist in resolving identified issues.

Doll, R., and Peto, R., The Cause of Cancer: Quantitative Estimates of Avoidable Risks of Cancer in the United States Today, Oxford University Press, Oxford, 1981.

Evidence that the various common types of cancer are largely avoidable is reviewed. Life-style and other environmental factors are divided into a dozen categories, and for each category the evidence relating those particular factors to cancer onset rates is summarised. Where possible, an estimate is made of the percentage of current U.S. cancer mortality that might have been caused or avoided by that category of factors. These estimates are based on epidemiological evidence because it is believed that available information based on animal and laboratory studies cannot provide data that are as reliable.

It is indicated that thirty percent of U.S. cancer deaths are due to tobacco, although it is possible that some nutritional factors may eventually be found to be important comparable contributors.

Trends in mortality and in onset ratio rates for many types of cancer are detailed in the appendices. The data on registration of new cases produce trends on cancer death certification rates, especially among old people. In (and before) middle age, there appear to be few real increases and few decreases in mortality for some particular types of cancer.

There is no evidence of generalised increases or decreases in mortality due to some new agent(s) or habit(s). The analyses suggest that, "apart from cancer of the respiratory tract, the types of cancer that are currently common are not peculiarly modern diseases and are likely to depend on some long-established factor(s)".

The proportion of current U.S. cancer deaths attributed to occupational factors is provisionally estimated at 4% (lung cancer being the major contributor). This is much smaller than has been suggested recently by various U.S. Governmental agencies. The matter could be resolved directly by a "case control" study (of lung cancer) two or three times larger than the recently completed U.S. National Bladder Cancer Study, but similar to it in methodology and unit costs.

DPA Group Inc., Assessment of the Cost of Reducing Risk in Industry and to Society, Atomic Energy Control Board, Ottawa, 1986. 206 pages.

The purpose of this project was to estimate how much money Canadian industry and society, are willing to spend for a reduction in non-radiological health risk. Several cases were selected for detailed analysis. These included cervical cancer screening in British Columbia, rail crossing signal improvement in Ontario, reduction of occupational exposure to lead in Ontario, oil and gas drilling accident reduction in Alberta, and the purchase and use of children's car set restraints..

Results were prepared in terms of expenditure per unit of risk reduction, based on estimates. The authors conclude that there is no one measure of spending for risk reduction but rather a number of such measures. As well, the report identifies methodological constraints in deriving the estimates and highlights considerations and directions for future research.

Drummond, M.F., Principles of Economic Appraisal in Health Care, Oxford University Press, Oxford, 1980. 130 pages.

This book is directed at non-economists who are interested in an economic appraisal of health care. It is targeted at different groups: medical researchers, epidemiologists, clinicians and other health professionals in research.

The volume gives an outline of the basic steps involved in an economic appraisal of health care alternatives. Its aim is to illustrate different degrees of sophistication displayed in the approaches observed among studies.

Duffus, J.H., Environmental Toxicology, Edward Arnold Publishers, Ltd., London, 1980. 164 pages.

Environmental toxicology is the study of the effects of toxic substances in both natural and man-made environments. The main task of the environmental toxicologist is to assess, objectively, the risks resulting from the presence of such substances. Duffus makes minimal use of mathematics, physics, and chemistry, so as to render the contents accessible to the widest possible audience. Although intended for students, the book should also be useful to scientists and other specialists who are faced with problems caused by environmental toxicants.

A bibliography of relevant material is provided, and a brief general guide to relevant information sources is presented in the Appendix.

Environment Canada, A Summary of Permits Issued Under the Ocean Dumping Control Act in 1985, Environment Canada, 1986.

This report contains information on ocean dumping permits issued by Environment Canada during the 1985 calendar year.

Permit applications which were withdrawn or rejected are not included. Cancellation of proposed dredging operations left five permits unused by their holders, and these are also not included.

Environment Canada, Environmental Protection Publications, Beauregard Press Limited, June, 1987. 89 pages.

As part of its technology transfer programme, the Environmental Protection Directorate publishes a series of technical reports. These reports are divided into nine categories with identifying code numbers and cover colours.

Two years after the initial introduction, a new series of technical reports was introduced- EnviroTIPS Manuals (Environmental and Technical Information for Problem Spills)- which provides detailed information on 50 chemicals, to enable effective planning of spill counter measures.

Included in the list of publications are reports published jointly by Environment Canada and the Ontario Ministry of the Environment under the Canada-Ontario Agreement on the Great Lakes Water Quality, and reports developed jointly with the Canada Mortgage and Housing Corporation.

Environment Canada, Keeping the Ocean Clean, Beauregard Press Limited, 1987. 34 pages.

The Ocean Control Dumping Act (OCDA) was passed by parliament in 1975 to reflect Canada's commitment to marine environmental quality and to fulfill international obligations under the London Dumping Convention. The OCDA programme has taken effective measures to prevent marine pollution. It does so by controlling and monitoring what types of substances are dumped into the oceans, where(in the ocean) those substances are dumped, and by using a comprehensive waste management approach for the review of disposal options. The mechanisms to implement these measures include a permit granting system, an inspection system, and a research programme.

OCDA controls have proved effective in limiting dumping operations to substances and locations where adverse effects on marine environmental quality are minimised. The scientific and technical expertise gained through administering the OCDA also enhances other issues in connection with marine environmental quality.

Environment Canada, Understanding CO_2 and Climate: Annual Report 1985, Atmospheric Environment Service, Environment Canada, 1986. 22 pages.

This is the third annual report prepared by Environment Canada on understanding CO2 (Carbon Dioxide) and climate. It provides a brief review of, and update on, current understanding of the issues from the global and Canadian perspectives. Additional background information appears in the appendices. These include a formal statement on the role of greenhouse gases on climate variations prepared by an international meeting of experts held in Villach, Austria in October 1985. Present international and Canadian research activities are reviewed and the issues of interest are reported.

The report states that global measurements of atmospheric composition, and of such important indicators as snow and ice-bound chemicals in polar regions, indicate that the human fingerprint is clearly evident at the earth's most remote and inaccessible regions. The trend is increasing and is threatening the well-being of the planet. This finding emerges from scientific research and is being manifested as a number of specific, and major global environmental issues such acid rain, ozone depletion, arctic haze, climate change, and human health impairment.

Environment Canada and Health and Welfare Canada, Final Report of the Environmental Contaminants Act Amendments Consultative Committee (ECAACC), Supply and Services Canada, Ottawa, 1986. 84 pages, plus appendices.

This report summarizes the consensus reached by the ECAACC on the essential changes required to update the Act. The proposals made were submitted to the Ministers of the Environment and National Health and Welfare for their consideration.

The report reflects a balance of viewpoints and interests expressed by members of a multi-partite committee. The recommendations, therefore, should be considered a complete package which, in the opinion of the committee, represents a significant improvement over the present situation.

Environmental Protection Service (EPS), National Urban Air Quality Trends 1974-1985, Beauregard Press Limited, Canada. 1987.

This report is based on air quality analysis work carried out by the National Air Pollution Surveillance (NAPS) monitoring network, which consists of air monitoring centres in most Canadian cities with populations over 100 000 persons. This is the sixth in a series of reports on ambient air quality trends issued by Environment Canada. Its purpose is to report trends in ambient air quality based on data collected through the NAPS Network and to identify changes by statistical and other forms of analysis. Monitoring results are presented for the study period.

Fabia,J., and Thuy, T.T., "Occupation of Father at the Time of Birth of Children Dying of Malignant Diseases," The British Journal of Prev. Soc. Med., 1974. Pages 98-100.

The purpose of this study was to investigate the possible link between malignant diseases in childhood and specific types of occupations held by fathers.

In previous studies of birth characteristics of children dying of malignant diseases, socio-economic class of fathers was the only variable assessed.

In reviewing a sample of birth and death certificates of Quebec children, the impression emerged that a large number of the fathers who were employed in petrol-related occupations had children who died from cancer. It was also found that occupations that increase the likelihood of childhood cancer included auto mechanics, machinists, miners and painters.

Fisher, D. (et al), Polluted Coastal Waters: The Role of Acid Rain, Environmental Defence Fund, April 1988. 102 pages.

Deposition of atmospheric nitrate, a component of acid rain, is a major source of nitrogen in the Chesapeake Bay and other coastal waters. One quarter of all nitrogen contributed by human activity to the Chesapeake Bay originates in acid rain and associated dry deposition falling directly on the Bay or onto its watershed.

In this report, the contribution of atmospheric nitrate is traced to a different problem which is found along the eastern seaboard of the United States. That is, the growth of nutrients in coastal waters led to algae blooms, eutrification and the destruction of marine life.

Fisheries and Environment Canada, Potato Processing Plant Liquid Effluent Regulations and Guidelines, 1977. 33 pages.

Some controls exerted under the Fisheries Act are intended to protect fish and other aquatic life from the deleterious effects of effluents from potato processing plants. The controls embodied in the regulations and guidelines apply uniformly across Canada as national baseline requirements. However, a potato processing plant located in an environmentally sensitive area may be subject to stricter controls, as provincial or local governments may impose more stringent standards than the federal requirements. Should that happen, the more stringent requirements prevail.

French, H.F., "Industrial Wasteland", Worldwatch, December, 1988. Pages 21-30.

Poland, Czechoslovakia, and East Germany in particular, suffer intolerable levels of industrial pollution. In Eastern Europe, water contamination is so severe that significant proportions of the water supplies are unfit for industrial use, let alone human consumption.

One of the primary ways in which pollutants enter the human body is through the food supply. One quarter of Poland's soil is believed to be too contaminated for safe farming. The government is considering a ban on growing vegetables in Silesia where garden samples register heavy concentrations of lead, zinc, cadmium, and mercury.

Widespread exposure to contaminated air, water, food, as well as to occupational hazards, is reflected in rising morbidity rates in those countries. For example, in Silesia, the rates of respiratory ailments and cancer increased twofold during the five-year period preceding publication of the subject article.

Fuller, E.G., We Almost Lost Detroit, Berkley Publishing Corporation,1984. 271 pages.

The author expresses the view that nuclear power is an unforgiving technology because it allows no room for human error. Perfection must be achieved if accidents which invariably affect the general public, adversely, are to be prevented.

The document is a valuable addition to the literature on the debate on nuclear power. The work is well-researched and written; it provides fascinating reading for anyone who is interested in the history of the nuclear programme.

The author provides an in-depth review of the Fermi accident which is used as a vehicle to discuss the significance of the technology in his country and abroad. Throughout the discussion, he describes the causes and consequences of a number of nuclear accidents in a manner that is easily understood. Overall, Fuller's work is not a technical presentation that is meant for scientists only; rather it is written in style and tone that will attract the layman.

Glenn, A.M., Orchard, D., and Sterling, A.M., Hazardous Waste Management Handbook, Fifth Edition, Corpus, 1988.

According to the authors, Environment Canada is undergoing a reorientation of its role and importance. They claimed, however, that under the leadership of the Minister, Tom McMillan, the department had regained a certain measure of focus and vigour.

That apparent reorientation was judged to have been built on the findings of a 1986 departmental study, which concluded that Environment Canada "Need not retain operational responsibilities to support the environmental quality objectives." In the report, "Improved Programme Delivery: Environmental Quality Strategic Review", it was recommended that the department provide national leadership, enhanced horizontal and national co-ordination, effective consultation and negotiations with stakeholders, balanced regulations, and fair mediation.

Go, F.C., Environmental Impact Assessment: An Analysis of the Methodological and Substantive Issues Affecting Human Health Considerations, Monitoring and Assessment Research Centre, University of London, 1987. 52 pages.

A principal mission of the World Health Organisation (WHO) is the promotion of procedures and approaches to planning, by governments, that can contribute to improvement in the quality of human health. One of the major developments has been the environmental impact assessment (EIA) methodology through which environmental considerations are incorporated into the planning process.

Interest in EIA began with the enactment, in 1969, of the United States National Environmental Policy Act (NEPA) which contained a provision requiring U.S. agencies to carry out environmental impact assessments as part of federal projects planning. Subsequently, various groups of experts at meetings convened by WHO and other agencies have concluded that together with economic and technical objectives, the EIA process can be an effective mechanism to foster human health and welfare considerations in development planning.

Conceptual principles and methodological approaches to EIA developed under NEPA are discussed insofar as they are useful in clarifying issues and in providing an historical and developmental perspective.

Go, F.C., Operational Cost-Benefit Analysis, Monitoring and Assessment Research Centre, University of London, 1988. 60 pages.

Although cost-benefit analysis (CBA) has been well-accepted as a valuable analytical tool in certain public planning capacities such as water resources development, its application to environmental impact assessment has not been widespread. The problem rests, partially, with the inherent difficulty of quantifying some environmental and health impacts, as well as with the fact that application of CBA methodology is frequently not fully understood by many participants. Furthermore, CBA does not eliminate the need for political resolution of conflicting objectives.

This guideline report concentrates on the operational aspects of applying CBA to evaluate projects when there are significant environmental impacts. It emphasizes the need for officials and planners in developing countries to have an overview of the subject and, perhaps even more importantly, to review the operational problems involved in applying CBA to environmental and health impact assessment.

Essential economic concepts relating to the application of CBA to human health and environmental problems are also discussed. Examples and case studies are included to illustrate how CBA has been used in a range of projects.

Gorham, D.A., Garland, C.F., Garland,F.C., Acid Haze Air Pollution and Breast and Colon Cancer Mortality in 20 Canadian Cities, 1980.

Sulphur dioxide absorbs ultraviolet light in the region of the spectrum which is the most active in forming vitamin D in the skin. Sulphate particles reflect light at that wavelength. High concentrations of these pollutants (termed acid haze) may lead to vitamin D deficiencies in exposed populations. Epidemiologic and laboratory evidence suggests that vitamin D plays a role in reducing the risk of colon and breast cancer.

The authors examined the association between sulphur dioxide and ultraviolet light-blocking aerosols in 20 Canadian cities, and age adjusted breast and colon cancer mortality rates in the census divisions encompassing those cities. Statistically significant positive associations were found between the measures of air pollution and age-adjusted mortality rates for colon cancer in women (multiple r= +.74, p=.003), and men (multiple r= +61, p=.03), and breast cancer in women (multiple r=+ 69, p=.007).

Mortality rates for other sites were also examined, but no statistically significant positive associations were found, consistently for both sexes. The ecological nature of this study is emphasized, and the possibility that an indirect association of other agent(s) could explain the findings is discussed.

Governments of Canada and the United States, First Report Under the 1987 Protocol to the 1978 Great Lakes Water Quality Agreement, December, 1988. 83 pages.

The Governments of Canada and the U.S., in 1972 and 1978, entered into agreements to restore and enhance water quality in the Great Lakes. In 1987, both governments signed the Protocol amending the Great Lakes Water Quality Agreement of 1978. The signing reaffirmed the governments' commitment to restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin ecosystem. Furthermore, it is indicated that the governments are determined to improve delivery of the agreement objectives and to demonstrate firm leadership in the implementation of control measures. Despite the complex jurisdictional problems involved, the Great Lakes Water Quality Agreement demonstrates that bi-national joint management by Canada and the U.S. is a better method of protecting the Great Lakes, compared to a situation in which either country acts on its own.

The report highlights progress made in implementing the revised agreement. The excellent working relationship that exists between the governments and their agencies enhances the parties' abilities to meet their commitments. In the first year of its existence, the Protocol led to the development of several initiatives which are outlined in the report.

Gwynne, M.D., "The Global Environmental Monitoring System (GEMS) of UNEP" (United Nations Environmental Programme), Environmental Conservation, Vol. 9, No. 1, Spring 1982. Pages 35-41.

GEMS is a collective effort of the world community to acquire, through monitoring, data that are needed for rational management of the environment. Following the recommendations of a UN Conference in Stockholm, 1972, The United Nations Environmental Programme (UNEP) was given, among its various tasks, the responsibility of coordinating and stimulating international monitoring activities, especially at the regional and global levels.

This overview by Gwyne, has highlighted the activities in which GEMS is directly involved. These include most of the activities carried out under the aegis of the United Nations.

Hammond, K.A., (et al) , Sourcebook on the Environment: A Guide to the Literature, The University of Chicago Press, Chicago Ill., 1978. 613 pages.

This book provides a guide to the literature on matters pertaining to the environment. Part I is an introduction to environmental philosophies/ perspectives and a preview of the future. Part II contains a selection of case studies on how the environment is treated. Part III includes basic references to environmental problems and how the environment functions.

An attempt is made to answer such questions as: Where can environmental information be found? What people, agencies, or institutions have accepted responsibility for problems that concern society?

Hawkes, N., (et al), The Worst Accident in the World, Chernobyl : The End of the Nuclear Dream, Pan Books Ltd., London, 1986. 246 pages.

When the soviet nuclear power reactor at Chernobyl blew up, a nuclear nightmare was realized. As radiation surged out of the stricken plant, the first panicky silence was followed by dramatic efforts to prevent a catastrophic melt-down.

This book provides details on what transpired at Chernobyl. It discusses the threat of such an accident to environmental degradation and to human health. Further, it gives some insight to the scientific and political future of nuclear development.

Herman, S.W., The Health Costs of Air Pollution: A Survey of Studies Published Between 1967 and 1977, The American Lung Association, 1977. 135 pages.

This report is an appraisal of 23 health cost studies published during the period, 1969 to 1977.

The report reveals that the estimated nationwide health costs of air pollution ranged from a few hundred million dollars to over ten billion dollars, per year. The lower range resulted from studies that considered only one or two major pollutants. Estimates associated with the following six pollutants (sulphur dioxide, particulate matter, nitrogen dioxide, hydrocarbons, carbon monoxide, and petrochemical accidents) approach or exceed the ten billion dollars range per year. The latter studies depended heavily on mathematical calculations rather than actual measurements. To date, there has not been a systematic and comprehensive estimate of health costs that are attributed to air pollution.

Highland, J.H., Fine, M.E., and Boyle, R.H., Malignant Neglect, Alfred A. Knopf, New York, 1979. 268 pages.

The document states that over the past few decades, there has been a significant increase in scientific knowledge about the nature of cancer. It also states that cancer is not an inevitable disease of old age, an infectious disease, or one caused by a particular virus.

"Curiously, the increase in scientific knowledge has not been reflected in increased public understanding of, or effective efforts at, cancer prevention. Rather, as more information on the causes of cancer has been made available, the public has responded first with concern, then with anger, and finally with dazed and cynical complacency, as it has come to perceive all chemicals, and everything we do, as causing cancer." The authors' aim is to dispel this concern and cynicism.

"Cancer is a complex mixture of diseases with an equally complex etiology." Many factors and substances, including cigarette smoke, are strongly implicated as causative agents. While the exact extent to which these factors currently influence cancer rates remains unclear, it appears certain that if voluntary and involuntary exposure to environmental carcinogens continues, cancer rates will soar beyond current occurrences.

Contents of the book have been enriched by valuable contributions provided by staff of the Environmental Defence Fund, based on their wide and varied expertise developed over a number of years on environmental health issues.

IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN/UNEP Joint group of Export on the Scientific Aspects of Marine Pollution (GESAMP), Reports and Studies: No. 15: The Review of the Health of the Oceans, United Nations Educational, Scientific and Cultural Organization, 1982. 108 pages.

This report evaluates the conditions and quality of the marine environment in relation to man's many uses of the ocean. The marine environment includes estuaries, coastal waters, and the open ocean. Prior to carrying out this evaluation, the authors (GESAMP) studied and reported on how the oceanic system works, e.g. the substances, activities, processes, and effects of the marine environment.

In assessing the health of the oceans, it was found that although effects of pollution have not yet been detected on a global scale, general trends of increasing contamination can be recognized in several areas. These trends serve as warning signals. The signals are most noticeable in coastal waters - those marine areas most intensely used by man.

The report notes that programmes for waste disposal must be maintained and regulations for the entry of new contaminants into the oceans must be developed. As well, the effects of pollution should be carefully monitored, and knowledge regarding the fate and effects of pollutants in the oceans must be improved, thereby ensuring that the health of the oceans is maintained.

International Maritime Organisation (IMO), Report of the Tenth Consultative Meeting, October, 1986. 62 pages, plus annexes.

"The tenth Consultative Meeting of Contracting Parties to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972" was held at IMO Headquarters, London, from October 13 to 17. The meeting agreed that the "Dumping of wastes at sea is an unacceptable way of waste disposal because the disposal of wastes in such a way may cause damage to the environment." In that connection, it was decided that it will be necessary to reduce the amounts which cause or might cause environmental damage. Furthermore, the aim is to work without delay within the framework of existing conventions in order to arrive at a complete ban on the dumping of wastes in the North Sea.

Kay, B.H., (et al), "West Coast Marine Environmental Quality: Summary Report", Environment Canada, December, 1986. 62 pages.

In 1983, the Environmental Protection Service undertook a two-year programme to summarise what was known about the state of British Columbia's marine water quality. During the period, hundreds of reports were examined and referenced into a data base. Technical summaries of the effects of pulp and paper, municipal and mining effluents on coastal waters were prepared.

Kerekes. J., The Chemical Composition of Lake Waters in Cape Breton Highlands, National Park, Nova Scotia: Progress Report, Canadian Wildlife Service, February, 1968. 33 pages.

In biological production, an important consideration is the availability of nutrients which, in lakes, are available in the water. The nutrients may originate from the soil and rocks surrounding the body of water, from underground springs, or from the atmosphere. Understanding the chemical composition of lake water can assist in estimating fish yields, by variety, and by lake.

For the study, water samples were taken from various water bodies within the Park and placed in polyethylene bottles. A Hellige pocket comparator checked the pH level at the time of sampling. Chemical analysis revealed that, due to pollution, many lakes did not contain enough nutrients to sustain attainable optimum fish stocks.

Kimbrough, R.D., Inter-Relation Between Environmental Monitoring Data , Human Exposure and Health Effects, U.S. Department of Health and Human Services, Georgia, 1981.

"This paper addresses a three-pronged sequence in chemical contamination:" the presence of chemicals in the human environment; the possibility that chemicals from the environment may actually get absorbed into the human body; and the possibility that, once chemicals have been absorbed, health impairment may result. This sequence of events does not always take place, however. Even if it does, it is difficult, and at times impossible, to establish such a direct chain of events.

The document reminds the reader that people are being exposed, continuously, to varying sorts of natural and man-made chemicals. Many of these in the form of nutrients are actually beneficial to health, some have perceptibly harmful effects on humans after exposure, while others have been known to have deleterious effects. Whether or not an outcome appears depends upon different factors such as, exposure, duration, susceptibility, and previous state of health.

King, R.L., Airport Noise Pollution: A Bibliography of Its Effects on People and Property, The Scarecrow Press, Inc., Metuchen, New Jersey, 1973. 380 pages.

This bibliography was originally organized for the Fadem and Manner law firm to educate the firm's lawyers on noise and its effects on humans. There are two basic methods of quantitative measurement of noise which is unwanted sound: frequency (pitch) and intensity (loudness). Frequency is the number of cycles per second taken through the noise-transmitting medium. It is expressed as cycles per second (cps), or as Hertz(Hz). The higher the cps the higher the pitch. There are no particular symbols for loudness.

This book presents facts about noise pollution and its effects, with more than 2000 citations (including books, articles, theses and dissertations, government documents, and unpublished papers).

Krewski, D., Risk and Risk Management: Issues and Approaches, University of Waterloo Press, 1986.

A model for environmental health risk assessment is formulated in terms of a sequential process involving a number of distinct stages, ranging from the identification of a particular health hazard to the ultimate regulatory response. Intermediate stages include estimation of the magnitude of the risk involved and the identification of possible risk management options which may be employed as a means of control. Decision criteria for choosing among these options are also considered, and the issues and approaches involved at each stage are discussed.

Krewski, D., and Birkwood, P.L., "Regulatory and Non-Regulatory Options for Risk Management", Health and Welfare Canada, 1987.

Control of risks to health, safety and the environment may be effected in a variety of ways. In the past, regulation was widely used as the main tool for risk management. More recently, non-regulatory options have received considerable attention, including those based on economic, advisory, and technological mechanisms.

This paper discusses the spectrum of control options that are available for health risk management, and considers possible criteria which may be used to select the most appropriate option(s) for application in specific circumstances.

Krewski, D., and Birkwood, P.L., " Risk Assessment and Risk Management", Health Protection Branch, Health and Welfare Canada, 1987.

The rational management of health and environmental risks ideally requires a well defined structured approach, in order that risk may be dealt with in a complete and adequate fashion. In this paper, formal models of risk assessment and risk management processes which have appeared in the literature in recent years are reviewed. Common elements among these models are identified, and the potential impacts of the approaches on practical decision making are examined.

Laboratory Centre for Disease Control (LCDC), Chronic Diseases in Canada: Summary of LCDC National Workshop on Asthma, Ottawa, May 19, 1988 Health Protection Branch, Health and Welfare Canada, 1988. 55 pages.

The Workshop was meant to bring together experts from various disciplines and affiliations for meaningful discussions regarding reported cases of asthma.

Asthma is a major health problem which affects over 500,000 Canadians. It is a disease that begins early in life and affects over 140,000 children below the age of 16 years, over 170,000 young adults aged 15-34 years and about 200,000 elderly people (Canada Health Survey, 1978-79).

Asthma death rates among young adults decreased from the early 1950's to about 1970, but have tripled subsequently. Hospital admissions increased sharply between 1970 and 1984, especially for people below the age of 15 years.

Last, A.M., Public Health and Human Ecology, Appleton and Lange, U.S.A., 1987.

This book describes the principal public health problems that existed at the time of writing. It provides an historical background and ecological perspective to explain the present situation and to suggest how the future might unfold.

Last believes that physicians and other health practioners ought to be as much concerned about health, and how to preserve and protect it, as they are about diseases and treatments. He attempts to ensure that readers of the book get an understanding of WHY things happen rather than of WHAT happens. This approach is in line with the recommendations of the report "General Professional Education of the Physician", which eloquently criticised the outmoded educational approach of stuffing medical students' minds with facts, while failing to equip them with ways to organise these facts into logical patterns.

Lave, L.B. and Seskin, E.P., Air Pollution and Human Health, John Hackneys University Press, 1977. 368 pages.

The authors believe that air pollution and human health have an important and direct relationship. Their study of the hypothesised air-pollution-health association was undertaken with financial assistance from Resources for the Future.

Lave and Seskin used a number of data sets, and performed many analyses in their attempt to gain further insight to the air pollution and health relationship. Their results pertain to a decade in which air pollution had been a problem of growing national and international concern. An important finding is that public awareness and concern about air pollution continues to rise, despite a decline in air pollution indexes from the "highs" of the mid 1960's.

Lee, D.H.K., Environmental Factors in Respiratory Disease, Academic Press, New York, 1972. 256 pages.

This book describes various diseases and their relation to environmental factors. Many of the chapters are devoted to case studies.

Although there has been long-standing concern that environmental factors are possible contributors to diseases, it has only been in recent years that the medical and scientific community has given widespread consideration to the matter. A fairly extensive survey was carried out with respect to occupational respiratory disease in the past 20-30 years, and cigarette smoking has received considerable interest. Community air pollution has played a significant role in increasing public attention to the potential health impacts.

Lee, S.D., Aerosols: Research, Risk Assessment and Control Strategies, Lewis Publishers, Inc., Chelsea, Michigan, 1986. 1221 pages.

This book presents the proceedings of the Second U.S. - Dutch International Symposium (May 1985). The topics discussed cover a wide range of issues concerning aerosols air pollution.

Sessions discussing the health effects of aerosols dominated the Symposium, focusing on the route of entry, toxicological studies, clinical studies, and epidemiology. Discussions on factors influencing respiratory tract deposition, the role of surrogate lung models in understanding mechanisms, and clearance models were the focus of the first session. The session on toxicological studies reported findings of studies on the effects of sulfate ions, diesel exhaust/soot, and nickel aerosols (each is a component of aerosols) as examined in animal models under various conditions. In the clinical studies session, the role of host factors in determining health outcomes was emphasized, especially differences in susceptibility. The last session reported on evaluations of mortality and/or morbidity associated with aerosols exposure.

Leiss,W., "The Risk Management Process", The Pesticides Directorate, Agriculture Canada, Ottawa, 1985.

This is a working paper, prepared for Agriculture Canada, and circulated widely among those interested in improving regulatory practices in the management of toxic chemicals.

The paper presents one concept of the risk management process with special reference to pesticides regulation in Canada. It starts from the decision-making procedures that are in place and, building on them, makes proposals for incorporating new consultative and communicative mechanisms. The work is addressed to individuals, public interest groups, the business community, university and government officials. Its main objective is to contribute to the ongoing dialogue among those who seek improvements in the risk management process.

Also included is a brief overview of the range of risk management techniques that are in effect in Canadian administrative practices. These include: Cost-effectiveness analysis, which is concerned with the attainment of a given objective at least cost; risk-benefit analysis, which weighs different levels of health risks against economic benefits; cost benefit analysis, which seeks to express all elements of risks and benefits in monetary terms, to determine whether a net financial benefit is attainable; and socio-economic impact analysis, which takes into account the possible effects on people and the economy of decisions taken in particular sectors.

McElroy, F.E., Accident Prevention Manual for Industrial Administration and Programmes, 8th Edition, National Safety Council, Chicago, Ill., 1981. 749 pages.

This edition is divided into two volumes: Administration and programmes; Engineering and technology. The entire document is an accummulation of facts and ideas that are part of the preoccupations of the safety movement. Its goal is to organise information to be used by those who are involved with accident prevention, safety and their effects, including death, injury, illness, property damage, etc..

Merrell, T.R.Jr., "Accumulation of Plastic Litter on the Beaches of Amchitka Island, Alaska", Marine Environmental Research, Great Britain, 1980. Pages 171-184.

The article states that during the period, 1972-1974, plastic marine litter on the beaches at Amchitka Island, Alaska, increased from 2221 to 5367 items. Most of the litter was believed to have originated from Japanese and Soviet fishing vessels, and some items may have come from the Asian coast. In 1972, an estimated 1664 metric tons of plastic litter was either lost or dumped from fishing vessels in the Bering Sea and North Pacific Ocean.

Stranded plastic litter persists and rapidly becomes submerged in beach material or is blown inland and become covered with vegetation. The most serious environmental impact is probably the entanglement of marine mammals and birds. Accelerating accumulation of litter could be reduced through unilateral action by countries that regulate coastal fishing activities, should these countries make litter control a condition for permission to fish.

Metro Study Corporation, Pollution: Its Impact on Mental Health, National Institute of Mental Health, U.S. Department of Health, Education, and Welfare, 1980. 81 pages.

The contributions of environmental pollution to mental health degradation are difficult to document, not because they are minor, but because they are ill-defined and tend to affect many different aspects of life. They range from the fairly direct damage done to the nervous system by toxic substances such as lead or mercury, to the indirect and delayed consequences of misguided adaptive responses made by the total personality to traumatic environmental situations. Although experimental models or conventional epidemiological analysis have not yet been able to investigate, satisfactorily, the full complexity of the environmental pollution impact on mental health, the elusiveness of the problem is no excuse for ignoring its importance or continued research effort in the area.

The factual examples described in this book illustrate that pollution, in its many forms, causes degradation of the quality of human life, not only through direct physiological damage, but also by disturbing mental health equilibrium.

Muir, T., and Sudar, A., Toxic Chemicals in the Great Lakes Basin Ecosystem: Some Observations, Inland Waters/Land Directorate, Ontario Region, Environment Canada, November, 1987.

This report discusses humans and their ecosystems, within a framework involving the disciplines of physics, biology, ecology, biochemistry, toxicology, sociology and economics. Its multi-disciplinary approach gives an over-all view of the inter-relationships that make up the ecosystem.

The report derives its purpose from the notion that there are sound social and economic reasons to evaluate the effects of toxic chemicals on the quality and health of the Great Lakes ecosystem. This is based on the idea that some human diseases may be caused by chemicals, and on the fact that toxic pollution and exposure to it are preventable.

The report concludes that humans are part of the ecosystem and that their health is being adversely affected, as are fish and wildlife. In addition, toxic chemicals are having negative impacts on the social and economic welfare of the people in the Great Lakes basin. As a result, the authors believe that major initiatives to reduce our reliance on products and processes which involve toxic chemicals would yield significant social and economic benefits.

Munn, R.E., The Design of Environmental Monitoring Systems: Update 1982, Institute for Environmental Studies, University of Toronto, Canada, 1982.

Munn is of the view that the optimal design of environmental monitoring systems is intellectually challenging and practically important. Many of the environmental issues of the 1980's attract widespread attention; for example, the acid deposition problem. In the light of budget constaints, however, it is extremely difficult to synthesize the monitoring meeds of the various scientific disciplines involved (meteorology, atmospheric chemistry, limnology, soil science, hydrology, forestry, etc.).

As the author pointed out in an earlier article on the subject, the optimal design of a monitoring system depends very much on the objectives established and the tolerances permitted, i.e. the precision with which the system is expected to operate. In the case of multipurpose monitoring systems, therefore, the expectations of many users may not be fulfilled.

National Research Council of Canada (NRCC), Associate Committee on Scientific Criteria for Environmental Quality (ACSCEQ) Status Report, National Research Council of Canada, Ottawa, 1981.

The ACSCEQ was set up by the NRCC to develop scientific guidelines for defining environmental quality.

The Associate Committee is concerned strictly with scientific criteria. Pollution standards and objectives for the purpose of pollution control are the responsibility of regulatory authorities. These standards and objectives are based on scientific criteria, but also take into account the socio-economic impacts of proposed measures as well as the state of existing technology.

The committee's work programme includes the evaluation of available information, in terms of the probability of the effects of contaminants on receptors, together with the related fundamental principles and scientific knowledge. Particular attention is directed to receptors and contaminants (and their interaction) that are important to Canada. This approach is deemed necessary because evaluations made in other countries or regions will not always be applicable to particular circumstances prevailing in Canada.

Natural Resources Defense Council, Intolerable Risk: Pesticides in our Children's Food, Natural Resources Defense Council, 1989. 141 pages.

This study analyzes children's (0-5 years of age) exposure to 23 pesticides in 27 fruits and vegetables frequently consumed by preschoolers and determines the potential hazard that these residues pose to children, including the development of cancer and disruptions in the central nervous system function.

It was found that preschoolers, relative to their weight, receive much greater exposure than adults to the majority of the 23 pesticides analyzed, and thus the potential health hazards are considerably greater. "More than 50% of a person's lifetime cancer risk from exposure to carcinogenic pesticides used on fruit is typically incurred in the first years of life." Further, high level exposure to organophosphate insecticides used on food items can cause nausea, convulsions, coma, death, behavioral impairments, and can alter the neurological function.

The report also describes the inadequacies of government regulation in this area, recommends specific regulation reforms, and suggests measures for limiting an individual's exposure to pesticides in food.

Neumeyer,R. The Atlantic Region Shellfish Growing Area Survey and Classification (GASC)Programme: Evaluation Report. Conservation and Protection, Environment Canada, Atlantic Region, 1987. 88 pages.

This evaluation of the Atlantic Region Shellfsh Growing Area Survey and Classification Programme was undertaken for several reasons. First, to demonstrate a commitment to fiscal responsibility in programme management. Second, to provide a comprehensive baseline of GASC procedures and operating environment. Third, to suggest realistic recommendations for enhancing the positive impacts of the GASC activity in the Atlantic Region. Fourth, to furnish a useful background for developing an acceptable national audit procedure for the Canadian Sanitary Shellfish Programme(CSSP).

To assist the reader, statements pertaining to areas of opportunity, difficulty, and importance, are highlighted.

Neutra, R., "Roles for Epidemiology: The Impact of Environmental Chemicals", Environmental Health Benefectives, Vol. 48, 1983. Pages 99-104

Aside from its well recognised role of documenting the extent of health impacts from exposure to environmental chemicals, epidemiology has other important roles. Arguing by analogy from the function of epidemiology in the infectious disease field, two practical public health functions are mentioned. The first is simply characterizing the population exposed, documenting the frequency of salient complaints, and providing this information to the affected population, so as to separate fact from fiction. The other practical public health function is to review available data bases to document the number of individuals exposed to the chemicals, and review gross trends by place and time in order to set public fears into proper perspective.

There are important descriptive scientific functions as well, namely, to detect the syndrome or symptom patterns which may be associated with chemical exposures. The sensitivity, specificity and predicative values of tests for pre-clinical diseases are also discussed.

Noyes Kane, D. "Bad Air for Children". Environment Magazine, 1976. Pages 26-34.

The purpose of this article is to explain the extent to which air pollution is more dangerous to children than adults. It informs the reader, and discusses the problems associated with indoor and outdoor air pollution. The author notes that children are especially sensitive to air pollution, and that the consequences to them may be of longer duration than in the case of adults.

There are several forces that set young children apart from adults when discussing physical, behavioural diseases and other factors. These include: higher breathing rates; much more activity; size; mouth breathing; more frequent respiratory tract infections.

Pearce, B.G. (Ed)., Health Hazards of VDT's? New York, John Wiley & Sons, 1984. 244 pages.

With a growing number of video display units (VDU's or VDT's) in offices around the world, there has been increasing concern as to whether they constitute health hazards to users. There have been allegations ranging from minor transitory problems, to more severe, irreversible impacts. It is therefore important to ascertain whether credence should be given to such allegations and, if so, whether the problems arise directly from all VDU's, only from some VDU's, or from circumstances unrelated to VDU's.

The book records the contributions of some leading authorities to the debate on the safety, health, and quality of life of users of the new technology. Among the leading authorities are scientists from a wide range of disciplines, representatives of equipment supply firms, users, medical advisors, and trade unionists. Inputs ranged from reports based on controlled laboratory studies to anecdotal comments clearly influenced by vested interest.

Pearse P.H. (et al), "Currents of Change: Final Report, Inquiry on Federal Water Policy," September, 1985. 222 pages.

This report assesses the adequacy of federal water policy and the capacity of Canada's institutions to respond to changing circumstances as it attempts to promote understanding and heighten awareness of the problems and opportunities in water management.

The report contains fifty-five specific recommendations for improving federal water policy. These deal with issues ranging from fundamental policy positions to administrative details. Collectively, they are meant to clarify federal responsibilities for water in Canada and to suggest a systematic organizational framework for meeting them.

Peat, Marwick and Partners, Environment Canada: Evaluation Framework for Environmental Protection, October, 1985. 70 pages.

The objective of this exercise was to develop a framework for evaluating Environment Canada's Environmental Protection mandate. The department's objective with respect to environmental protection is: "To protect the environment by influencing human activities in a way that will achieve and maintain a state of the environment necessary for the health and well-being of man, the health and diversity of species and ecosystems, and the sustained use of natural resources." As this objective reflects some activities carried out in other parts of the departments, one of the major tasks of this study was to develop a definition of "environmental protection" so that the scope of future evaluation activity could be clearly defined.

The authors describe the rationale and mandate of environmental protection, the relevant legislative and policy environments, and a conceptual framework which relates management activities to environmental issues. In addition, they discuss different approaches to identifying the work that is relevant, outline major evaluation issues, and present varying approaches for priorizing the evaluation issues.

Plagiannakos, T. and Parker,J., An Assessment of Air Pollution Effects on Human Health in Ontario, Ontario Hydro, March, 1988. 25 pages, plus appendices.

This study is a follow-up to Ontario Hydro's 1981 submission to the National Energy Board, aimed at quantifying health and other social costs incurred in Canada as a result of fossil fuel generated electrical exports to the U.S. The goal was to implement a planned three-step approach to estimating human health costs that are associated with changes in pollution levels in Ontario.

Step number one would quantify the relationship between exposure to different levels of air pollution and total respiratory morbidity and mortality rates. A second step would use this relationship for predicting changes in health indicators associated with some specific changes in the levels of air pollution. Finally, the third step would assign monetary values to the predicted changes in health indicators.

Platt, R.E., and Griffiths, J.F., Environmental Measurement and Interpretation, Van Nostrand Reinhold Company, 1964. 284 pages.

The focus is on the terrestrial environment, and the treatment is restricted to the measurement of such factors as moisture and temperature. The unique aspects of environmental contaminants, such as radioactive fallout, pesticides, and industrial wastes are excluded, since they are dealt with elsewhere in the literature. Telemetry is deferred for a later edition to await the more advanced stage of electronic development which is essential to a lucid presentation.

According tc the authors, environmentally oriented research is now firmly established in quantitative terms. Experimental designs are improved, increased, and varied. New concepts and techniques in instrumentation which enable scientists to obtain sensitivities and developments in analysis and interpretation of data, from simple statistical procedures to computer programming, permit simultaneous evaluation of many variables.

Plestina, R. (Ed)., "Biological Monitoring of the General Population - the CEC and WHO/UNEP Approaches". Chemical Hazards, Institute for Medical Research and Occupational Health, Zagreb, 1980.

Based on experience gained in the field of occupational health which shows that biological monitoring can provide a better assessment of integrated exposure than ambient air monitoring, both the Commission of the European Communities (CEC) and the World Health Organisation/United Nations Environmental Programmes (WHO/UNEP) are undertaking extensive biological monitoring programmes of the general population.

While the approaches of the two programmes are different, close cooperation has been established so that they will provide complementary results as far as is feasible. The CEC programme, while confined to lead measurements in blood, is the more intensive and already is being implemented. In addition to measuring lead in blood, it will also assess the results in terms of reference values previously agreed upon by member States.

The WHO/UNEP programme when implemented, will have a broader geographic coverage (10-15 countries) and will include more pollutants (lead and mercury in blood, cadmium in blood and kidney, and certain organo-chlorine pesticides in mother's milk). In addition, both programmes will provide data on current levels of exposure as well as trends in exposure levels for both the general population and specific groups.

Cooperation between the sponsoring organizations takes place during the planning stages on quality control activities and on the treatment and exchange of results.

Portnoy, B.L., (et al), "Oyster-Associated Hepatitis: Failure of Shellfish Certification Programmes to Prevent Outbreak", Journal of The American Medical Association, 1975. Pages 1065-1068.

During October and November 1973, outbreaks of hepatitis A associated with the consumption of raw oysters, occurred in Houston, Texas and Calhoun, Georgia. The oysters in both outbreaks had been harvested in two Louisiana bays. Although the bays had been contaminated with water from the Mississippi River two months before the oysters were harvested, by harvest time the waters had met national sanitation standards for shellfish growing and, consequently, were certified for oyster fishing. These epidemics raised serious questions about the adequacy of the shellfish monitoring systems then in place.

Purchase, I.F.H., Stafford, J., and Paddle,G.M., "Vinyl Chloride: A Cancer Case Study". Toxicological Risk Assessment, Vol. I, Boca Raton, Florida: CRC Press, 1985.

Vinyl Chloride Monomer (VCM), more properly named mono-chloroethene, is a colourless gas normally handled under pressure and boils at -14 degrees Celsius at atmospheric pressure. Discovered around 1835, the commercialization of VCM did not begin until the 1930's. Present output is about 12x10(6) metric tones per annum, nearly all of which is used in making the polymer, polychloride.

The authors state that until the 1960's, VCM was regarded as a material of low toxicity to humans and that the main concerns were related to its narcotic effects. Now, there is little doubt that exposure to high levels of VCM can cause increased incidence of angio sarcoma of the liver. A review of 20 epidemiological studies involving about 45,000 workers occupationally exposed to VCM showed that neoplasms of the liver were increased, on incidence, in the majority of studies. For brain cancer, the association between exposure to VCM and increased incidence is less clear.

Raman, S., (et al), Mortality Study of Canadian Military Personnel Exposed to Radiation: Atomic Test Blasts and Chalk River Nuclear Reactor Clean-ups 1950's, University of Ottawa, 1984. 163 pages.

An historical cohort study of the group of Canadian military personnel who were exposed to radiation during the 1950's at atomic bomb test blasts in the U.S. and Australia, and at clean-up operations at the Chalk River laboratories, is described. Overall and cause-specific mortality in the exposed group was compared to that of a control group of unexposed military personnel, matched on age, service, rank, and trade.

The analyses indicate no elevation in the exposed group, in overall or cause-specific mortality due to diseases associated with radiation. Since this study was restricted to an investigation of mortality, there is no generalization of the results (or conclusions) to current morbidity experienced by the exposed group.

Ramazzini, B., Diseases of Workers, Hafner Publishing Company, 1964.

Historically, there have been connections between occupation and health. An Egyptian papyrus, for example, comments on the hard life of people who must work with or near dangerous substances for a living. The influences of certain occupations on health were noted by physicians and laymen in Graeco-Roman times. Although a considerable amount of information was available on this subject from Greek and Roman literature, it was not until the late middle ages that this subject became the object of systematic study.

Ramazzini focuses on the following occupations: metal miners; chemists; painters; tobacco workers; brewers; nurses; cleaning personnel; workers who stand all day; runners; athletes; those who strain their eyes in over-time work; farmers; fishermen; lawyers; carpenters; sailors; and hunters.

Redding, M.J., Aesthetics in Environmental Planning, Prepared for the Office of Research and Development, U.S. Environmental Process TRR #921, 1983. 24 pages.

The relationship between aesthetics and environmental planning is addressed. Primary emphasis is placed on man/environment interaction, with another goal directed towards improving the understanding of aesthetic concepts and the implication of using those concepts in research and planning activities.

Methodologies for measuring or quantifying aesthetics are reviewed, as well as the state-of-the-art of research in basic theory for understanding the unquantifiable.

Resource and Environmental Economics Laboratory, University of Wyoming, "Two Experiments in Measuring Aesthetic Preferences", The Laboratory, Laramie, Wyoming, June 1977. 33 pages.

This paper discusses the visibility effects of atmospheric emissions from coal-fired steam generating plants in the Four Corners Region of the United States. A summary of the empirical results, as well as the sources and specification error are provided.

The research task was to estimate the value individuals place on being able to see long distances. This estimate was sought because coal-fired electric generation plants in the Southwest reduced average visibility in the area.

The paper consists of several sections. Section 1 discusses the research task and how it was brought about. Section 2 discusses the research design and study area. Section 3 presents the theoretical structure of the approaches taken and discusses problems in the methodological design. Section 4 contains preliminary results of experiments. Section 5 presents an empirical example of the household substitution approach, and Section 6, the conclusions.

Ridker, R.G., Economic Costs of Air Pollution: Studies in Measurement. Frederick A. Praeger Publishers, New York, 1968. 214 pages.

Economists have long recognised the need for public regulation of economic activities that result in unwanted side effects. These effects, called "external diseconomies" may arise whenever market forces alone are insufficient to make individuals bear all costs resulting from his/ her actions. Air pollution, which results from using the air as a waste disposal medium, is an excellent example of external diseconomies, since there are clearly no market forces that compel the user to consider the costs he/she imposes on others. Without regulation, therefore, the air is used as if no such costs are involved and air pollution rises to a level that is socially undesirable.

Rosen, G. Preventive Medicine in the United States, 1900-1975: Trends and Interpretations, Prodist, New York, 1977.

The objective of this work was to trace major trends in preventive medicine during the twentieth century, and to interpret the significance of current developments for future action. To that end, the author attempts to provide answers (or at least indicate where they may be sought) to such questions as: "Why have some forms of preventive action been effective while others have not?", "Why the existence of valid knowledge of disease etiology does not necessarily lead to effective prevention?", and "How do social, economic, political, and ideological elements facilitate or hinder preventive action?".

Ross, S.A., (et al), Design and Selection of Small Wastewater Treatment Systems, Ministry of Supply and Services Canada,1980. 295 pages.

The document provides general information on the design and selection of wastewater systems capable of serving populations of up to 2500 persons. This information is intended to be used by individuals having limited experience in wastewater treatment and disposal, and limited access to a source of available alternatives in small systems. The steps and procedures to be undertaken when selecting a particular wastewater management scheme for a small community are outlined.

Material covered includes: measurement and estimation of water flows; physical, chemical and biological characteristics of domestic wastewater; on-site wastewater treatment and disposal processes; central wastewater collection and treatment systems; and operating problems associated with small treatment systems.

Santolucito, J.A., (Ed) Environmental Monitoring and Assessment: An International Journal, Volume 2, D. Reidel Publishing Company, Boston, U.S.A., 1982.

This special issue is a collection of papers that were presented at the International Workshop on Exposure Monitoring held in Las Vegas, Nevada, from October 19-22, 1981, and co-sponsored by the United States Environmental Protection Agency, the World Health Organization, the United Nations Environment Programme, and the University of Nevada, Las Vegas.

The workshop was attended by approximately forty scientists representing the major subject areas which comprise exposure monitoring. "For purposes of the Workshop, exposure monitoring was defined as that kind of environmental monitoring and related measurements designed to facilitate exposure assessments of selected populations or segments of the environment."

Sax, N.I., Cancer Causing Chemicals, Van Nostrand Reinhold Company, New York, N.Y., 1981. 466 pages.

The book aims at presenting information that will aid individuals in shunning hazards that are easily avoided.

The author thinks that the complexities of our times are such that anyone wishing to avoid cancer-causing exposure must either learn more about science and technology or live in a state of constant anxiety or resignation. Just as prehistoric man feared the awesome forces of the natural world, people in industrialised nations live in fear of the unnatural world. "It is tempting to resign ourselves to the fact that we live in a sea of carcinogens, and there is no way to part that sea".

Some cancer can be prevented, and the means of prevention are at hand. As an oversimplification, environmental exposure might be reduced to two classes: Voluntary and Involuntary. Although cigarette smoking is an addictive habit, it has been classified voluntary. Air pollution, on the other hand, whether from cigarette smoke or from factories, falls in the involuntary category.

Schultz, M.S., and Loeb Kasen, V., Encyclopedia of Community Planning and Environmental Management, Facts on File Publications, N.Y., 1984. 475 pages.

This encyclopaedia incorporates the following "fields" into one easy to use desktop reference volume: land use co-ordination and control; economic development; transportation; flood control; air and water pollution. Among the topics that are featured prominently are land use regulation, community facility planning, economic development, transportation planning, facility planning, urban design, analytical tools and techniques, housing, social planning, historic preservation, recreation, and open space management.

Schwartz, E.M., and Rae, W.A., "Effect of Polybrominated Biphenols (PBB) on the Developmental Abilities of Young Children", American Journal of Public Health, Vol. 73, No. 3, 1983. Pages 277-281.

Eighteen children, aged 4 to 6 years, with known exposure to PBB's in utero and/or through breast milk, were administered developmental tests. These same children had exhibited low scores on partial developmental tests two years earlier. The latest results were compared to normative test data. The findings showed that PBB cohort children were within the normal range in all areas assessed and that there was an inverse relationship between PBB fat level and scores on some developmental tests. The importance of these findings for later development is unclear, and thus, will be exposed to future monitoring.

Schweitzer, G.E., "Risk Assessment Near Uncontrolled Waste Sites: Role of Monitoring Data", Environmental Monitoring and Assessment 2 (031-044), 1982. Pages 15-32.

The traditional approach of coupling estimates of human exposure to individual chemicals with library studies of the toxicity of those chemicals as the basis for quantitative assessments of risk is not adequate when considering problems located in close proximity to hazardous waste sites. For example, there are:

(a) too many chemicals and mixtures involved;
(b) contaminant uncertainties;
(c) future exposure problems associated with ground water and soil contamination.

Among the items to be considered in expanding the dimensions of traditional risk assessment methodologies are:

(i) identification of chemical groups or of dominant toxic chemicals of principal concern and the likely man-made as well as natural pathways for environmental migration,
(ii) the role of biological monitoring in addition to traditional monitoring approaches
(iii) the coupling of monitoring data with past, current and future population activity patterns, and with epidemiological and other health care data.

Seagull-Walker, E.A., "Developmental Abilities of Children Exposed to Polybrominated Biphenals (PBB)", American Journal of Public Health, Vol. 73, No. 3, 1983. Pages 281-285.

To investigate whether ingestion of PBB's has an adverse effect on the neuropsychological development of young children exposed in utero and in infancy, five tests of the McCarthy Scales of Children's Abilities were administered to a group of 19 PBB exposed Michigan children. When the data for the exposed group were analyzed according to body burden, correlations ranging from -.5228 to-.3004, were found between the natural logarithms of the children's fat PBB values and their standardized scores on the developmental scales. Four of the five correlations were significant at $p<.05$. Multivariate analysis of covariance confirmed the existence of a significant main effect for fat PBB level, with parental education held constant. Children with higher body burdens of PBB scored significantly lower than those exposed who had lower body burdens on the same four tests, and on a composite score representing overall performance. These results suggest the existence of an inverse relationship between body levels of PBB and some developmental abilities in young children.

Shrivastava, P., Bhopal: Anatomy of a Crisis, Ballinger Publishing Company, 1987. 184 pages.

The author asserts that the Bhopal tragedy, triggered two years ago (at time of writing), continues. Understanding the causes and consequences of this crisis, and learning lessons for the future, is the least that can be done to commemorate those whose lives were unalterably changed by the incident. An event of such phenomenal social and technological scope cannot be adequately explained by traditional concepts and theories. To deal with its complexity, new ideas are needed, and examples of such new ideas are put forward in the book.

The author expresses the view that, as the end of this century approaches, more new and complex technologies will emerge in the industrialized world. Simultaneously, more hazardous technologies will enter communities in developing countries. As a result, industrial crises are likely to become more frequent and larger in scope. The Chernobyl nuclear accident, the Challenger shuttle explosion, and the Bhopal disaster are reminders that such occurrences can be worldwide; they can occur in the most advanced countries, come from the most sophisticated organisations, and offer compelling arguments for urgency in developing long-term solutions to industrial crisis problems.

The book is intended to stimulate greater research effort into industrial crises. It addresses, in detail, what happened in Bhopal, the consequences of the accident, and the crisis management responses by the government, the victims and volunteer organizations. Using empirical data based on the Bhopal case, it seeks to analyze the crisis from the perspective of three main stakeholders: the Union Carbide Corporation, the government of India, and the victims. Finally, it discusses preventative and coping actions that corporations, governments, and communities should take in dealing with industrial crises.

Slorach, S.A., "The WHO/UNEP Pilot Project on Assessment of Human Exposure to Pollutants Through Biological Monitoring", Environmental Monitoring and Assessment 2, (1031-044), 1982. Pages 33-41.

The objectives, development and current status of the World Health Organisation/United Nations Environmental Programme (WHO/UNEP) pilot project are described. The project was carried out within the framework of UNEP's Global Environment Monitoring System (GEMS) and was supported by funds from UNEP. Its long-term objective was to develop and strengthen national, regional, and global biological monitoring programmes that will make it possible to accurately assess human exposure to selected toxic pollutants by measuring their concentrations in human tissues and body fluids.

In this pilot project, the levels of lead and cadmium in venous blood, cadmium in the kidney cortex, and certain organochlorine compounds in breast milk were determined in selected population groups in 10-12 countries in different parts of the world. Each participating laboratory was required to achieve satisfactory results in the quality assurance phase of the project before starting to analyze the human samples, and to carry out quality assurance during the monitoring stage. (See Vahter, M. for the metals component-lead and cadmium; and Slorach and Caz for the organochlorine component of the project).

Slorach, S.A., and Vaz, R., (Eds.), Assessment of Human Exposure to Selected Organochlorine Compounds Through Biological Monitoring, Swedish National Food Administration, Uppsala, Sweden, 1983. 134 pages.

"This is the final report of the WHO/UNEP Pilot Project on Assessment of Human Exposure to Pollutants through Biological Monitoring."

The objectives of the project included the following:

a) to review and agree internationally on selected methods to be used in analysis and evaluation of levels of a limited number of pollutants to selected human tissues and body fluids;

b) to provide technical advice and arrange training programmes for scientists and technicians;

c) to design and implement a programme for rigid quality control in connection with sampling, transport, and analysis of human tissues and body fluids;

d) to carry out pilot studies on selected segments of the population in a number of countries, including Belgium, Federal Republic of Germany, India, Mexico, People's Republic of China, Israel, Japan, Sweden, the U.S., and Yugoslavia.

Smith, M.E., and Newcombe, H.B., "Use of the Canadian Mortality Data Base for Epidemiological Follow-up", Canadian Journal of Public Health, Vol. 73, February 1982.

The practice of epidemiological follow-up of large cohorts exposed to potentially harmful substances and circumstances, has been facilitated in Canada by the development of a consolidated file of information on all deaths in the country, dating back to 1950. This mortality data base was designed to permit convenient searches by computer, and to yield both dates and underlying causes of deaths among members of a study population that include uranium miners, nickel workers, hard rock miners, and radiation workers, plus some exposed to asbestos, fibreglass, vinyl chloride and formaldehyde vapour.

Most of the studies utilizing the data are based on groups of people numbering in the tens of thousands. The studies are concerned with the long-term consequences of various occupational types, medical treatments and diagnostic procedures, and with circumstances of other kinds which may contribute to deaths from cancer, cardiovascular disease, etc.

Society of American Foresters (SAF), Acidic Deposition and Forests, 1984. 48 pages.

Regional air pollutants, transported from points of release, can cause gradual changes over time in the growth, species composition, metabolism, and pest interactions of forest ecosystems. These widespread changes are more important than the more dramatic, localised, forest destruction that can be observed close to the point of these sources of pollution.

The SAF believes there is urgent need for an aggressive research programme in view of the limited, though significant, research findings on the effects of acidic deposition and air pollution on forests. In the face of mounting evidence that forest productivity has been declining worldwide, researchers know too little about the complex ecosystems and the cumulative effects of subtle stresses from atmospheric pollutants.

Southern California Association of Governments (SCAG) and South Coast Air Quality Management District (SCAQMD), Air Quality Management Plan: South Coast Air Basin, Final Report, 1989.

This is the final version of the Air Quality Management Plan (AQMP) for the South Coast Air Basin of the U.S.A. Its purpose is to set forth a comprehensive programme that will lead to compliance with federal and state air quality standards within the basin.

Both federal and state governments have set health-based air quality standards for the following pollutants: sulphur dioxide, lead, ozone, nitrogen dioxide, carbon monoxide, and fine particulate matter. The standards are designed to protect residents from illness or discomfort with a margin of safety.

Additionally, California has set standards for ethylene, hydrogen sulfide, sulfates, visibility, and vinyl chloride.

Adoption of the Plan by the SCAQMD, SCAG, and the California Air Resources Board commits these agencies to an extensive list of research, regulatory, and other activities needed to implement the measures contained in the Plan.

Stanley Associates Engineering Ltd., Review of Treatment Technology in the Fruit and Vegetable Processing Industry in Canada, Supply and Services Canada, Ottawa, 1977. 207 pages.

This report is a review of the state-of-the-art of wastewater treatment in the Canadian fruit and vegetable industry. The findings are based on data from light plants and are not an inventory of Canadian processing plants.

Since the fruit and vegetable industry is both wide-ranging and complex, eleven major commodities were selected for study. Additionally, investigators used some data from U.S. sources where a data bank on 650 processing plants exists. Only data which were pertinent to the Canadian scene from the U.S. data bank were used.

The report found that the levels of wastewaters discharged by the Canadian industry were generally high, with great potential for oxygen depletion in receiving waters.

Stanley Associates Engineering Ltd., An Inventory of the Fruit and Vegetable Industry in Canada, Supply and Services Canada, Ottawa, 1978. 134 pages.

Basic information on the economic and environmental aspects of the fruit and vegetables industry, including potato processing, was collected through questionnaires sent to all known fruit and vegetable plants reported in Canadian literature sources. The questionnaire responses were analysed and combined with data obtained from Statistics Canada and other sources in order to obtain a total Canadian picture with respect to production, waste treatment techniques and effluent loadings.

The recommended approach of the Environmental Protection Service (EPS) to pollution control is to adopt a strategy of containment at the source by means of best applicable technology, not only treatment, but in-plant process technology as well. Regulations are based on control methods, both in-plant and treatment, which provide a reasonable degree of environmental inventory without inflicting undue economic hardships. The first steps are to identify the problem(s) in terms of an environmental inventory of the industry and to conduct a "state-of-the-art" review to include waste characterizations, process and waste treatment technologies.

Swiss, J.J. (et al), Ocean Dumping Report #3: Regulated Levels of Schedule One Substances in the Ocean Dumping Control Act. Government of Canada, Department of Fisheries and Oceans, Ottawa, 1980. 73 pages.

This document summarises available environmental information for each of the substances specified in Schedule 1 of the Ocean Dumping Controls Act. Based on this information, recommendations are made with respect to the suitability of the regulated limits of these substances which include the following: mercury; cadmium; persistent plastics; oil and grease; radioactive compounds; and organohalogen compounds. A review of the literature on these substances is provided in the appendix.

Tennant, A.D., (et al), Salmonella in Poultry Packing Plant Effluents, Ottawa: Environment Canada, Environmental Protection Service, Ontario Region, 1975. 75 pages.

Concern that salmonella associated with poultry production in Ontario may be recycled through the environment by the discharge of inadequately treated waste effluents led to the conduct of three case studies of poultry processing plants in 1975. Salmonella of various serotypes were shown to be present in raw and treated wastes at three large, well-operated plants. The data showed support for the need for effective treatment and disinfection of such wastes if the problem of poultry associated salmonellosis is to be contained.

The incidence of antibiotic resistance among faecal coliforms and salmonellae isolated from the waste was evaluated. Methods for the isolation of salmonellae are proposed for use in poultry waste treatment operations.

The International Joint Commission, Pollution of Boundary Waters: Report of the Consulting Sanitary Engineer Upon Remedial Measures, Government Printing Office, Washington, D.C., 1918.

Investigations were carried out in order to compile data for a report that would address the following dilemmas:

1. "To what extent and by what causes and in what localities have the boundary waters between the United States and Canada been polluted so as to be injurious to public health and unfit for domestic and other uses?"

2. "In what way is it possible and advisable to remedy or prevent the pollution of these waters, on either side, without the injury of health or property on the other?"

The investigation includes a review of the results previously reported by the Commission with respect to existing pollution of the waters. These results are then examined with special reference to the nature and extent of injury to health or property which can be linked to pollution crossing the boundary. Extensive field and office studies of drainage and treatment plans were then made in the more important cases (the St. Clair, Detroit and Niagara Rivers) in order to determine specific treatment of the sewage (chief source of the pollution) that will remedy or prevent continued pollution of the waters. These remedies were then discussed in detail.

The International Joint Commission (IJC), Committee on the Assessment of Human Health Effects of Great Lakes Water Quality, Workshop on "The Role of Epidemiology in Assessing the Effects of Great Lakes Water Quality on Human Health", Working Document, 1988, 445 pages.

Prompted by the paucity of epidemiological activity in the area of water pollution and health, the existence of militating, "enormous and perhaps intractable" methodologic problems, a recognition of the need to improve the status quo, and an hypothesis that there may be feasible methodologic options, this workshop was convened by the IJC Planning Committee on March 2-3, 1988. The purpose of the workshop exercise was to engage in high-level professional discussions/exchanges in connection with the IJC's interest "in evaluating the usefulness of epidemiology as a tool in surveillance of health problems related to contamination of the waters of the Great lakes".

The workshop was designed to address and make recommendations on the following areas of concern:

1. Modifications that could be made to available data bases, or the types of new data bases that are required, in order that the data are made more valuable for epidemiological purposes;

2. Types of epidemiological studies that could be undertaken in relation to the various water quality parameters and adverse health outcomes, mindful of the adequacy and quality of available data as well as of resources and time constraints;

3. Criteria that should be adopted for judging the feasibility of the epidemological studies.

4. Prior to the workshop, the Committee distributed the above issues to potential participants, and requested comments which, in the participants' view, would improve the quality and usefulness of the workshop recommendations.

5. The role of epidemiological evidence in dealing with concerns of a community that its water supply may be injurious to the health of its citizens; and

6. The available sources and adequacy of funding to facilitate effective epidemiological studies in the health - water quality area.

At the workshop, empiric and speculative papers were presented; the former group dealt with Canada-U.S. data sources, while the latter addressed methodological options and proposals for future study. Time limitations precluded consideration of related issues such as air pollution, food contamination (except fish) or consumer products.

The Task Group on Metal Interaction, "Factors Influencing Metabolism and Toxicity of Metals:A Consensus Report", Environmental Health Perspectives, Vol. 25. Pages 3-41.

A series of meetings to discuss metal toxicology was organised by the Scientific Committee on the Toxicology of Metals under the Permanent Commission and International Association on Occupational Health. Important factors affecting toxicity in metals, with special reference to their absorption, excretion and biological half-lives, were discussed in Slancev Bruag, Bulgaria, 1971, and in Buenos Aires, 1972. During a meeting in Tokyo, 1974, effects and dose-response relationships were discussed, and the participants produced reports which summarize the discussions and conclusions from the earlier meetings.

Toronto Star Editorial, "Towing an Acid Line," The Toronto Star, January 4, 1989. Page A-4.

The article points out that some of Ontario's largest polluters have agreed to "clean up their acts" at costs of approximately one billion dollars over five years. The companies include INCO. Ltd., Ontario Hydro, Algoma Steel Corp., and Falconbridge Ltd.

Furthermore, the article states that Canadians must stand together to convince neighbours in bordering States of the U.S.A. that half of this country's acid rain pollution is caused by them, and that they also should "clean up their acts". It is revealed that nine U.S. States have joined Ontario in a lawsuit aimed at getting the Environmental Protection Agency to order more acid rain controls in the Midwest.

Torrance, G., and Krewski,D., Economic Evaluation of Toxic Chemical Control Programmes, 1985.

This study focuses on programmes that are assigned to improve human health by reducing the risks posed by toxic chemicals that can be evaluated within the same basic framework for the evaluation of toxic chemical control programmes. Consideration is given to the costs of the programme itself, as well as to industries and the public.

Improvements to human health are considered along with economic and aesthetic gains. Techniques for measuring both costs and benefits are discussed. Some of the commonly used analytical tools in programme evaluation are cited, including cost-effectiveness analysis, cost-utility analysis, cost-benefit analysis, and risk-benefit analysis.

Transportation Review Board (TRB), Atmospheric Emergencies: Existing Capabilities and Future Needs, TRR#902, National Research Council (U.S.), Washington, D.C. 1983. 38 pages.

During the last decade, the amount of injuries and/or deaths caused by transportation incidents involving hazardous materials increased four-fold and the actual number of incidents increased eight-fold.

The subject document reveals that the proceedings were organized into three broad categories: background; modelling; and monitoring. The background section consists of three papers that address the nature of the emergencies and response plans. The second section on modelling addresses several subjects: the physics of the problem (including release, gravity spread, and dispersion) the assessment methods currently used by two military groups, a state agency, and a private firm; and the radiation hazards from low specific activity wastes. The monitoring section is comprised of two papers; one gives an overview of potentially applicable techniques and the constraints imposed by the unique nature of emergency incidents while the other reviews the potential for the use of remote sensing systems.

Transportation Review Board (TRB), Transportation of Hazardous Materials: Toward a National Survey Strategy (Vol.2), TRR# 197, 1983. 91 pages.

This report was prepared over a two-and-a-half year period during which selected committees put forward a list of conditions to govern the ten most hazardous materials. The list is comprised of the following:

1. The need for harmonious international, federal, state,and local hazardous materials regulatory controls.

2. The complexity of the hazardous materials Regulations and the need to convert some of them from detailed specifications to performance-based criteria.

3. The need for a national strategy on controls.

4. A single national response system for incidents and accidents involving the transportation of hazardous materials.

5. An integrated hazardous materials transportation and communication system among federal and state governments.

6. Training for all those involved in the transportation of hazardous materials, including shippers, carriers, and emergency response personnel.

7. A comprehensive data system on the flow of hazardous materials.

8. The need to synthesize and evaluate for its practicality, the state-of-the-art for hazardous materials transportation and the cost-benefit risk analysis methodology.

9. Clarification of the legal responsibilities of governmental and private agencies involved in goods and materials transportation, and

10. The need to make the public more aware of the relative safety of hazardous materials transportation.

United Nations, Educational, Scientific and Cultural Organization, Reports and Studies: The Review of the Health of the Oceans # 15, 1982. 108 pages.

This report by the ACMRR/WHO Joint Working Party concerning the health of the oceans includes data from the Marine Pollution (petroleum) Monitoring Project of the integrated Global Ocean Station Systems (IGOSS). It indicates that of the area monitored, which included major shipping lanes, between .05 and .1 percent of the sea surfaces is covered by oil films at any given time-much of this substance eventually descends to the sea floor.

There is no confirmed record of human illness having been caused by consumption of marine organisms PCB's. The concentrations of PCB residues in some marine organisms are below the level set by some national authorities with a view to safeguarding human health.

United Nations Environmental Programme (UNEP), "Protection of the Marine Environment Against Pollution from Land-based Sources: Montreal Guidelines", Elsevier Science Publishers, North Holland, 1985. Pages 77-83.

Guidelines are presented to assist governments with the process of developing appropriate bilateral, regional and multinational agreements, as well as national legislation, for the protection of the marine environment against pollution from land-based sources. The guidelines are prepared on the basis of common elements and principles drawn from relevant existing agreements and drawing upon experience gained through their preparation and implementation. They are presented as a broad framework for the development of similar agreements in other areas where they may be deemed necessary. For example, it was intended that they might also be used for guidance of governments in areas not covered by regional agreements, for preparation in the longer term (should the need arise) of a global convention on pollution from land-based sources, and for reviewing the effectiveness of measures taken.

United Nations Environmental Programme (UNEP) and the World Health Organization (WHO), Assessment of Freshwater Quality, GEMS, London, 1988. 80 pages.

This project was named the GEMS/WATER Project. It included the collection of data on 50 different indicators of water quality, including dissolved oxygen, biochemical oxygen demand, faecal coliforms and nitrates, as well as chemical trace constituents and contaminants.

The main objective of the report was to make an assessment of global water quality, paying special attention to regional differences.

United Nations Environmental Programme(UNEP) and The World Health Organization (WHO), Assessment of Urban Air Quality, Global Environmental Monitoring System (GEMS), London, 1988. 100 pages.

This report, the GEMS/AIR Project, contains an evaluation of urban air quality. It extends to fifty countries and cities which were chosen to represent different climates, levels of development, and pollution problems. There were usually three GEMS/AIR monitoring stations in each city; one in a residential area, one in an industrial zone, and one in a commercial zone.

Indoor pollution as it relates to industrialized and developing countries is examined in an appendix.

An important finding is that air pollution problems that may threaten human health and well-being include the following: warming of the atmosphere; reduction of the stratospheric ozone layer; acidic deposition; quality of indoor air; industrial accidents; and polluted urban air.

U.S. Department of the Interior, (et al); Oil and Hazardous Materials: Emergency Procedures in the Water Environment, Edison, New Jersey, August, 1968.

The purpose of this manual is to provide basic information on the characteristics and effects of the pollutants, as well as procedures to be followed in cases where hazardous materials enter into the water environment. The booklet deals with approximately fifty petroleum and chemical products.

Vast quantities of those products are shipped via waterways, rail, truck and pipeline. Industrial needs are expanding as well as advances in transport technology, thereby increasing the risk of accidental discharges and spills that can seriously destroy the quality and hence usefulness of water that is close to or far away from the discharge source(s).

U.S. General Accounting Office, Controller General, Report to the Congress of the United States: An Analysis of Issues Concerning Acid Rain. Gaithersburg, M.D., General Accounting Office, 1984. 185 pages.

The issues involved in decision-making with regard to controlling acid deposition, commonly referred to as "Acid Rain", are examined. This study was undertaken to determine whether available scientific information could indicate if it were appropriate to begin control actions now, or if control actions should await a better understanding of the problem.

The present state of knowledge on acid rain issues is described. Also presented, is a series of observations based on an analysis of the major questions involved in the on-going debate.

Vahter, M., Assessment of Human Exposure to Lead and Cadmium Through Biological Monitoring, National Swedish Institute of Environmental Medicine and Department of Environmental Hygiene, Karolinska Institute, Stockholm, 1982. 136 pages.

This paper describes the development and results of the metals component (there is also an organochlorine component - see Slorach and Vaz) of the UNEP/WHO pilot project on human exposure to pollutants through biological monitoring. The project was carried out within the framework of the Global Environmental Monitoring System (GEMS), and was initiated following the recommendations from a UNEP/WHO meeting (held in Geneva, 1977) of a group of government experts on health related monitoring.

The main objectives were:

1. to review and agree, internationally, on methods to be used for the analysis and evaluation of levels of a limited number of pollutants in selected human tissues and body fluids;

2. to provide technical advice and arrange training programmes for scientists and technicians;

3. to design and implement a programme for rigid quality control in connection with sampling, storage, transport, and analysis of tissues and body fluids; and

4. to undertake several studies on selected segments of the population in certain countries.

This component of the project was divided into two phases. The first was devoted primarily to providing training and technical assistance to the various laboratories. The ability of those participating to measure lead and cadmium in blood samples and cadmium in kidney cortex improved significantly during this phase. The second phase was devoted to the actual monitoring of lead and cadmium in the above mentioned tissue and body fluid. The results were then discussed.

Victor, Peter, Evaluation of Costs Associated with Human Health Impacts, Prepared for the NRCC, 1985. 161 pages.

This monograph describes part of the NRCC's project on the risks, costs, and benefits associated with occupational and consumer exposure to pesticides and industrial organic chemicals.

The application of welfare-accounting and output-accounting methodologies in the determination of costs associated with diseases/illnesses caused by industrial organic chemicals, including pesticides, is examined.

The author concludes that adjustments to the output-accounting method will probably produce a more cost effective and practical approach than the welfare accounting method in determining the costs of health impacts. Data sources for such analyses are identified and examined for their usefulness in valuing health impacts. It is also concluded that the usefulness of the literature on health costs would be enhanced if the information were linked more closely to specific categories of diseases.

Wagoner, Joseph, "Toxicity of Vinyl Chloride", Journal of Toxicology and Environmental Health, Hemisphere Publishing Corporation, Washington, D.C., 1980. Pages 1101-1107,

In 1974, vinyl chloride (VC) was first reported in the scientific literature as an agent that induces angiosarcoma of the liver in animals and humans. Further research has demonstrated its carcinogenicity to other organs. Target organs for VC now include the liver, brain, and lungs, and probably the lymph nodes system.

The carcinogenic risk has been extended to jobs associated with polyvinyl chloride (PVC) exposure. This is evidenced by cases of liver angiosarcoma reported among individuals employed in or residing at locations close to PVC fabrication facilities, and by epidemiologic studies demonstrating significant association between lung cancer and exposure to PVC dust. Association between PVC dust and pneumonoconiosis has also been demonstrated.

Webb, R.H., and Wilshire,H.G., Environmental Effects of Off-Road Vehicles: Impacts in Arid Regions, Springer-Verlag New York Inc., 1983.

The purpose of this book is to provide authoritative information on physical and biological impacts of off-road vehicles on desert ecosystems. The authors hope that the information will be used to formulate general management guidelines on the use of such vehicles (ORV) in arid areas.

The book was written as a result of a public meeting on the environmental effects of human uses of resources in the California Desert Conservation Area. One of the most controversial subjects discussed at the meeting was the use of recreational off-road vehicles (ORV's) and their effects on the natural desert terrain of California.

Non-recreational vehicles also produce adverse effects on the environment in arid areas. Chief among them are military vehicles and those used in mineral exploration. Serious problems resulting from recreational and non-recreational vehicular uses have been reported in western United States, Near East Deserts, North Africa, Peru, Australia, Russia, and China.

Weller,P., (et al), Acid Rain: The Silent Crisis, Between the Lines, Inc., Ontario, Canada, 1980. 104 pages.

This work is an attempt to synthesize research done in recent years on acid rain and its effects on human health and the environment. It stems from the belief that information about the environment and its abuses are of concern to all and should not be the sole responsibility of scientists.

The author suggests that in order to solve the problems of acid rain, the political, social, and economic factors which have allowed them to develop must be understood. Towards that goal, the book examines decisions made by industry and governments that have contributed to the persistence of acid rain.

Wells,P.M., (et al), "Marine Environmental Quality in Canada", Oceans 87 (1987: Halifax, N.S.) Vol. 5. Pp. 1633-1636.

Marine environmental quality (MEQ) is important both domestically and internationally. It is critical to the economies and quality of life in coastal communities. This work by Wells (et al) discusses international obligations including Canada's role in preparing the 1985 UNEP "Montreal guidelines for the protection of the marine environment against pollution from land-based sources; the promotion of the World Commission on Environment and Development; and our support for the 1982 United Nations Convention on the Law of the Sea."

The paper presents some of the principal findings and conclusions of a national assessment of MEQ undertaken by the MEQ Working Group of Conservation and Protection, Environment Canada. Highlights on each coastal region are given, followed by an overall assessment.

Wexler, P., Information Resources in Toxicology, Elsevier/ North-Holland Inc., 1982.

Toxicology deals with chemical, physical, and biological (i.e. plant and animal toxins) hazards to man. The chemical group has unavoidably been emphasized in research, regulations, and press coverage, due to the large number of potentially dangerous commercial chemicals involved and the large populations that are exposed to them.

Although literature on toxicology is proliferating at a phenomenal rate, and access to the literature by use of computer data bases and other means is fairly adequate, there is yet to be a succinct guide directing interested parties to the major sources of information in the field. Wexler's work is an attempt to fill this void, by presenting a selective and annotated list of information sources. The list includes material that has the potential of being widely and frequently used, as well as material that may not necessarily be of reference use but is representative of a subject or format. Both the relatively broad areas of toxicology and the more specific fields of interest are covered.

White, N. and Little, F.J. North American Reference Encyclopaedia of Ecology and Pollution, North American Publishing Company, Philadelphia, Pennsylvania, 1972. 334 pages.

"Some of the most important health problems in the modern world arise from environmental threats which are not perceived by the senses and which do not produce acute toxic effects." For example, increases in chronic pulmonary diseases, cancer and some genetic defects can be traced to pollutants that are absorbed gradually over time from toxic sources.

White and Little believe that new types of toxicological and epidemiological studies are needed in order to determine the long-range effects of environmental pollutants. The book presents material on environmental pollutants for reference and study. Furthermore, there are individual articles on such pollutants as lead, asbestos and pesticides.

Wigle, D.T., (et al), Chronic Diseases in Canada, Health and Welfare Canada, 1988. 59 pages.

Increased prevalence of chronic diseases has been placing increased pressures on Canada's health resources to cope with the expenses associated with morbidity and premature mortality resulting from these outcomes. In order to set priorities effectively in the allocation of health resources, it is essential that the magnitude of the economic costs of illnesses be understood.

This project by Wigle, et al., has employed the human capital approach in translating morbidity and premature mortality into direct and indirect costs to society.

Wills, M.R., and Savory,J., "Aluminium Poisoning: Dialysis, Encephalopathy, Osteomalacia and Anaemia." The Lancet, July 2, 1983. Pages 29-33.

Poisoning attributed to aluminium was fist reported in 1921. The patient, a metal worker, suffered memory-loss, tremors, jerking movements, and poor coordination. Five years later, C.T. Betts drew attention to the potential health hazards of the aluminium present in city drinking water and various medicines. The toxicity of aluminium was, however, dismissed in comprehensive reviews in 1957 and again in 1974. In those reviews, the only health hazard recognised was that associated with industrial exposure and inhalation of heavily aluminium-contaminated dust.

The subject paper reveals that abnormally high serum and tissue aluminum concentrations were recognized in patients with chronic renal failure on long-term haemodialysis. Several possible reasons for this excess of aluminum are given. This accumulation causes an encephalopathy, accounts for one component of dialysis osteodystrophy, and may be responsible for some of the other complications of treatment by haemodialysis. However, aluminum-induced complications of haemodialysis are preventable.

World Health Organization (WHO), Environmental Health Impact Assessment of Urban Development Projects: Guidelines and Recommendations, WHO Regional Office for Europe, June 1985. 189 pages.

This report is aimed at providing practical guidelines on environmental health impact assessment (EHIA). It is described as "the assessment of the impact of development on environmental parameters recognized to have a strong health significance (called environmental health factors)."

More specifically, the paper deals with the identification of environmental health factors, gives guidance on prediction of their likely magnitude and impacts on human health (including several high-risk groups within the population), and indicates mitigation measures which can be taken to minimize the adverse effects of urban development projects. Also included are recommendations for further work to increase the scope and coverage of urban EHIA. These include, inter alia, further epidemiological and toxicological studies of the effects of pollutants on human health, work on the effects of urban layout, and further development of healths indices to measure health levels.

World Health Organization (WHO), Health and Safety Component of Environmental Impact Assessment, WHO Regional Office for Europe, Copenhagen, 1987. 180 pages.

Although the environmental health effects of development projects, policies and plans are among the most important considerations in deciding whether to proceed, they have received limited attention in environmental impact assessment (EIA).

Environmental health impact assessment, when carried out as recommended by World Health Assembly resolution WHA35.19, will contribute to the achievement of the important targets of health for all. In the past, EIA had failed to include adequate assessment of the effects of development decisions on the health and safety of affected communities, but the worldwide growth of EIA as a decision-making tool provides a good opportunity to improve consideration of the health consequences of such decisions. To help fulfil the potential of EIA in protecting human health, a WHO-sponsored working group, on which this report is based, established the following four basic principles:

1. One of the fundamental considerations in the approval of projects, policies and plans should be the health of the communities to be affected.

2. Greater consideration should be given to the consequences of development policies and programmes to human health.

3. EIA should provide the best available factual information on the consequences to health of projects, policies and plans.

4. Information on health impacts of projects should be made available to the public.